PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Idaho Natural Production Monitoring And Evaluation

BPA project number: 9107300
Contract renewal date (mm/yyyy):   7/1999   ☒ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Idaho Department of Fish and Game

Business acronym (if appropriate)   IDFG

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NPPC Program Measure Number(s) which this project addresses
3.2, 3.2c, 4.1a, 4.2a, 4.3c.1, 5.0a, 5,0b, 5.0e, 5,0f.7, 7.1c, 7.1c.3

FWS/NMFS Biological Opinion Number(s) which this project addresses
1995 NMFS Biological Opinion

Other planning document references
Snake R. Salmon Recovery Plan, NMFS 1997, August 8, Draft

Short description
Improves adult-to-smolt and smolt-to-adult survival of chinook salmon and steelhead. Identifies limiting factors and methods to improve survival. Provides monitoring to determine the effectiveness of recovery actions and population status.

Target species
Snake River spring and summer chinook salmon and steelhead

Section 2. Sorting and evaluation

Subbasin
Salmon River, Clearwater River

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
☒ Anadromous fish ☐ Resident fish ☐ Wildlife	☒ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☒ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☐ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
8909800	Idaho supplementation studies	PIT tags chinook and steelhead used in smolt-to-adult return rate (SAR) analysis, collects samples from chinook carcasses for aging, estimates production, collects data for general parr monitoring sites
8909802	Salmon supplementation studies	PIT tags chinook and steelhead used in SAR analysis, collects samples from chinook carcasses for aging, estimates production and productivity for limiting factor analysis, collects data for general parr monitoring sites
8909803	Salmon supplementation studies	PIT tags chinook and steelhead used in SAR analysis, collects samples from chinook carcasses for aging,

		estimates production and productivity for limiting factor analysis, collects data for general parr monitoring sites
8909801	Salmon supplementation studies	PIT tags chinook and steelhead used in SAR analysis, collects samples from chinook carcasses for aging, estimates production and productivity for limiting factor analysis, collects data for general parr monitoring sites
9005500	Steelhead supplementation studies	PIT tags steelhead used in SAR analysis
9064	Chinook salmon spatial habitat analysis	Conducts salmon escapement monitoring which complements proposed work for increased escapement monitoring
9102800	Monitoring smolt migration of wild Snake River spring/summer chinook	PIT tags chinook used in SAR analysis
5520800	Listed stock adult escapement monitoring	Conducts salmon escapement monitoring which complements increased escapement monitoring
9801002	Captive rearing initiative for Salmon R. chinook salmon, M&E	The report on chinook population status will be used by project 9801002 to identify high risk populations that could potentially benefit from a captive program
9303501	Red R. Watershed Restoration Project	This project measures fish production and productivity in Red R. and as such is an integral monitoring component of the Red R. watershed restoration project.
9600600	PATH- Facilitation, Tech. Assistance & Peer Review	General parr monitoring and smolt-to-adult information produced by this project have been used in the PATH process
9600800	PATH- Participation by State and Tribal Agencies	General parr monitoring and smolt-to-adult information produced by this project have been used in the PATH process
9700200	PATH- UW Technical Support	General parr monitoring and smolt-to-adult information produced by this project have been used in the PATH process

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1984	The general parr monitoring database was started in 1984 and continues today. It represents the most comprehensive salmon and steelhead database in Idaho and is the only longterm database for steelhead.	Yes, this accomplishment established a means of monitoring Idaho salmon and steelhead on a population basis.
1985	Documented the relative success of instream structures versus off-channel habitat development to increase parr production.	Yes, this accomplishment provided information to direct future work to increase adult-to-smolt survival.
1988	Increased chinook and steelhead parr production by over 135,000 fish following habitat improvements.	Yes, this accomplishment increased adult-to-smolt survival.
1988	Identified factors affecting survival of chinook and steelhead parr.	Yes, this accomplishment provided information to direct future work to increase adult-to-smolt survival.
1988	Estimated chinook egg-to-parr survival in the headwaters of the Salmon River and Crooked River.	Yes, this accomplishment established a measure of chinook salmon productivity.
1988	Estimated chinook egg-to-parr survival of fish supplemented by different methods (e.g. adult outplants, fry releases, egg outplants).	
1988	Estimated survival impacts due to irrigation diversions.	Yes, this accomplishment provided information to direct future work to increase adult-to-smolt survival.
1989	Estimated seeding level for A-run and B-run steelhead in specific rearing areas.	Yes, this accomplishment established a means of monitoring Idaho salmon and steelhead on a population basis.
1992	Identified differences in peak arrival time to Lower Granite dam between hatchery and wild chinook.	Yes, this accomplishment provided information to improve survival of wild chinook salmon through adjustment of hydrosystem operation.
1993	Determined release strategies for hatchery chinook smolts and adults to increase survival and production.	
1994	Documented adult chinook and steelhead escapement to three pristine wilderness streams during 1994-1996.	Yes, this accomplishment identified smolt-to-adult survival as the factor most limiting wild chinook salmon

		and steelhead.
1997	Identified decreased survival associated with multiple collection and bypass.	Yes, this accomplishment resulted in a change in dam operations resulting in higher smolt-to-adult survival.
1997	Verified PATH chinook salmon smolt-to-adult recovery goals with Snake River basin smolts/female estimates.	Yes, this accomplishment confirmed goals for smolt-to-adult survival as accurate.
1998	Completed model for estimating smolt-to-adult return rate by migration route.	Yes, this accomplishment identifies migration routes with the greatest potential for achieving recovery.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Produce chinook salmon smolts per female consistent with the Snake R. basin average (220 smolts/female) in all major watersheds of the Salmon River and Clearwater River basins.	a	Synthesize information regarding population productivity, total smolt production, parr densities, and lifestage survival rates of spring and summer chinook in the Salmon and Clearwater River basins with information regarding habitat parameters obtained
			from appropriate agencies (e.g. BPA, USFS, BLM, IDEQ, etc.).
2	Achieve 2-6% smolt-to-adult suvival for chinook salmon and 3-7 % for steelhead in the Snake River basin.	a	Continue estimating smolt-to-adult survival of Snake River spring and summer chinook salmon (as an aggregate) and steelhead by migration route (transported, bypassed, never collected) and overall survival.
		b	PIT tag wild juvenile steelhead to increase the number of adult returns for the analysis in Task 2a.
		c	Continue estimating smolts/female for aggregate Snake River basin spring and summer chinook salmon to identify smolt-to-adult survival needed to achieve recovery.
		d	Continue reporting weekly smolt detection information for the entire Snake River basin during the spring outmigration to IDFG managers for recommending actions regarding hydrosystem operation.

3	Manage and collect long-term monitoring data on spring and summer chinook and steelhead population abundance and characteristics to document status and trend.	a	Continue managing the general parr monitoring database which includes information on densities of sp/su chinook salmon juveniles, steelhead juveniles, resident fish juveniles, and habitat parameters throughout the Salmon and Clearwater River basins.
		b	Investigate the need to expand general parr monitoring sites to integrate parr monitoring with escapement index areas
		c	Expand sp/su chinook escapement monitoring to include all metapopulations identified in the NMFS recovery plan.
		d	Determine the relationship between redds in index areas relative to redds in the entire drainage for key populations.
		e	Continue indexing steelhead escapement in the Salmon and Clearwater River basins by conducting aerial redd counts.
		f	Confirm age estimates of spring and summer chinook salmon from previous years if possible.
		g	Utilize coded-wire-tagged hatchery adults from as many sites as possible and wild PIT tagged adults to develop an archive of aging structures as a means of validating age estimates.
		h	Continue enumerating chinook and steelhead escapement over weirs and conducting redd counts.
		i	PIT tag a minimum of 700 emigrating chinook parr during the summer and fall, and 500 emigrating smolts during the spring, annually. PIT tag all steelhead juveniles of sufficient size.
		j	Continue monitoring chinook and steelhead parr densities in trend areas.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	7/1999	6/2007	Produce chinook salmon smolts per female consistent with the Snake R. basin average (220 smolts/female) in all major watersheds of the Salmon River and Clearwater River basins.	X	18.17%
	7/1996		Achieve 2-6% smolt-to-adult suvival for chinook salmon and 3-7 % for steelhead in the Snake River basin.		37.86%
3			Manage and collect long-term monitoring data on spring and summer chinook and steelhead population abundance and characteristics to document status and trend.		43.97%
				Total	100.00%

Schedule constraints
Completion of Objective 1 is dependent upon the nature of available data and the amount and kind of remedial work necessary. As such, the completion date of 6/2007 represents a rough estimate.

Completion date
It is expected that monitoring under Objectives 2 & 3 will continue at least until recovery is achieved. Objective 2 relies on detectors at the lower Snake R. dams. If these dams are breached tasks under this objective would cease.

Section 5. Budget

FY99 project budget (BPA obligated): $731,659

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel		%41	311,942
Fringe benefits		%15	112,299
Supplies, materials, non-expendable property		%7	55,015
Operations & maintenance		%6	48,640
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%5	37,500
NEPA costs		%0	0
Construction-related support		%0	0
PIT tags	# of tags: 0	%0	
Travel		%4	28,935
Indirect costs		%17	133,181
Subcontractor		%5	40,000
Other		%0	
TOTAL BPA FY2000 BUDGET REQUEST			$767,512

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		%0	
		%0	
		%0	
		%0	
Total project cost (including BPA portion)			$767,512

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$838,439	$871,977	$906,856	$943,130

Section 6. References

Watershed?	Reference
☐	Baker, T., A. Wertheimer, R. Burkett, and seven others. 1996. Status of Pacific Salmon and Steelhead Escapements in Southeastern Alaska. Fisheries: Special Issue on Southeastern Alaska and British Columbia Salmonid Stocks at Risk. Vol 21, No 10.

☐	Barber, Willard E. and Gordon A. McFarlane. 1987. Evaluation of Three Techniques to Age Artic Char from Alaskan and Canadian Waters. Transactions of the American Fisheries Society 116:874-881
☐	Beamish, R. J. and G. A. McFarlane. 1983. The Forgotten Requirement for Age Validation in Fisheries Boilogy. Transactions of the American Fisheries Society 112:735-743.
☐	Chilton, D. E. and H. T. Bilton . 1986. New Method for Ageing Chinook Salmon (Onchorhynchus tshawytscha) Using Dorsal Fin Rays, and Evidence of Its Validity. Canadian Journal of Fisheries and Aquatic Science 43:1588-1594.
☐	Cramer, Steven P. and Doug Neeley. June 1993. Revaluation of Delisting Criteria and Rebuilding schedules for Snake River Spring/Summer Chinook and Sockeye Salmon. Recovery Issues for Threatened and Endangered Snake River Salmon Technical Report 10 of 1
☐	Ebel, W. 1977. Columbia River salmon and steelhead. In: E. Schwiebert, ed. Proceedings of a Symposium, Vancouver, Washington, March 5 1976-March 6 1976.
☐	Elms-Cockrum, Terry J. May 1997. Salmon Spawning Ground Surveys, 1996. Pacific Salmon Treaty Program. Annual Report. Idaho Department of Fish and Game. IDFG 97-25.
☐	English, K. K., Bocking, R. C. and J. R. Irvine. 1992. A Robust Procedure for Estimating Salmon Escapement Based on the Area-Under-the-Curve Method. Canadian Journal of Fisheries and Aquatic Sciences. 49:1982-1989.
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☐	Hall, D.L. 1991. Age Validation and Aging Methods for Stunted Brook Trout. Transactions of the American Fisheries Society 120:644-649.
☐	Hall-Griswold, J.A., E.J. Leitzinger, and C. Petrosky. 1995. Idaho Habitat/Natural Production Monitoring, Part I, General Monitoring Subproject. Ann. Rept. FY 1994.
☐	Hall-Griswold, J.A. and C. Petrosky. 1996. Idaho Habitat/Natural Production Monitoring, Part I. Ann. Rept. FY 1995.
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☐	Hill, Ryan A. 1997. Optimizing Aerial count Frequency for the Area-Under-the Curve Method of Estimating Escapement. North American Journal for Fisheries Management. 17:461-466.
☐	Holubetz, T.B., 1995. Wild Steelhead Studies. FY 1993.
☐	Idaho Department of Fish and Game. 1990. Idaho Habitat Evaluation for Offsite Mitigation Record. Ann. Rept. FY 1988.
☐	Idaho Department of Fish and Game. 1991. Idaho Habitat Evaluation for Offsite Mitigation Record. Ann. Rept. FY 1989.
☐	Kiefer, R. and K. Forster. 1991. Idaho Habitat and Natural Production Monitoring. Ann. Rept. FY 1989.
☐	Kiefer, R. and K. Forster. 1992. Idaho Habitat and Natural Production Monitoring, Part II. Ann. Rept. FY 1990.
☐	Kiefer, R. and J. Lockhart. 1994. Intensive Evaluation and Monitoring of

	Chinook Salmon and Steelhead Trout Production, Crooked River and Upper Salmon River Sites. Ann. Rept. FY 1992.
☐	Kiefer, R. and J. Lockhart. 1997. Intensive Evaluation and Monitoring of Chinook Salmon and Steelhead Trout Production, Crooked River and Upper Salmon River Sites. Ann. Rept. FY 1994.
☐	Leitzinger, E.J. and C. Petrosky. 1995. Idaho Habitat/Natural Production Monitoring, Part I. Ann. Rept. FY 1993.
☐	Leitzinger, E., K.Plaster, P. Hassemer, P. Sankovich. 1996. Idaho Supplementation Studies. Annual Report 1993. Project number 89-098, DE-BI79-89BP01466, Bonneville Power Administration, Portland, Oregon.
☐	Link, W. and J. Hatfield. 1990. Power calculations and model selection for trend analysis: a comment. Ecology. 71: 1217-1220.
☐	Marshall, A. 1992. Genetic analysis of 1991 Idaho chinook salmon baseline collections. Attachment B. in Leitzinger, E., K. Plaster, and E. Bowles. 1993. Idaho supplementation studies. Annual Report 1991-92. DOE-89-098, BPA, Portland, OR.
☐	Mundy, P. R., D. Neeley, C. R. Steward, and seven others. 1994. Transportation of juvenile salmonids from hydroelectric projects in the Columbia River basin; An independent peer review. Final Report. USFWS, Portland, OR.
☐	National Marine Fisheries Service. Reinitiation of consultation on 1994-1998 operation of the federal Columbia River power system and juvenile transportation program in 1995 and future years. Signed: March 2, 1995.
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☐	Northwest Power Planning Council. 1986. Columbia River basin fishery planning model, technical discussion paper.
☐	Park, D. 1985. A review of smolt transportation to by pass dams on the Snake and Columbia Rivers. In U.S. Army Corps of Engineers, Walla Walla district. Comprehensive report of juvenile salmonid transportation. Portland, OR.
☐	Petrosky, C.E. and T.B. Holubetz. 1985. Idaho Habitat Evaluation for Offsite Mitigation Record. Ann. Rept. FY 1984.
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☐	Petrosky, C.E. and T.B. Holubetz. 1987. Evaluation and Monitoring of Idaho Habitat Enhancement and Anadromous Fish Natural Production. Ann. Rept. FY 1986.
☐	Petrosky, C.E., T.B. Holubetz, and L.B. Everson. 1988. Idaho Habitat Evaluation for Offsite Mitigation Record. Ann. Rept. FY 1987.
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	Production Monitoring, Part I, General Monitoring Subproject. Ann. Rept. FY 1990.
☐	Rich, B.A., W. Schrader, and C. Petrosky. 1993. Idaho Habitat/Natural Production Monitoring, Part I, General Monitoring Subproject. Ann. Rept. FY 1991.
☐	Rich, B.A.and C. Petrosky. 1994. Idaho Habitat/Natural Production Monitoring, Part I, General Monitoring Subproject. Ann. Rept. FY 1992.
☐	Rieman, B. and J. McIntyre. 1996. Spatial and temporal variability in bull trout red counts.North American Journal of Fisheries Management, v. 16: 132-141.
☐	Skalski, J. 1990. A design for long-term status and trends monitoring. J. of Environmental Management. 30:139-144.
☐	Thedinga, J., M. Murphy, S. Johnson, J. Lorenz, and K. Koski. 1994. Determination of salmonid smolt yield with rotary-screw traps in the Situk River, Alaska, to predict effects of glacial flooding. No. Amer. J. of Fish. Mgt., v. 14: 837-851.
☐	Ward, D. L., R.R. Boyce, F.R. Young, and others, 1997. A review and assessment of transportation studies for juvenile chinook salmon in the Snake River: North American Journal of Fisheries Management, v. 17, p. 652-662.
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PART II - NARRATIVE

Section 7. Abstract

Survival of Snake River basin spring and summer chinook and steelhead can be considered a product of survival in the spawning and rearing environment (adult-to-smolt) and in the migration corridor and ocean rearing environment (smolt-to-adult). The Columbia Basin Fish and Wildlife Plan and the Idaho Fish and Game Anadromous Plan have numerical escapement goals for salmon and steelhead to the Snake River basin. Improving survival during both the adult-to-smolt and smolt-to-adult stages is the only means of achieving these goals. This project provides data and analysis necessary to make informed decisions to improve survivals in the adult-to-smolt (Objective 1) and smolt-to-adult (Objective 2) stages. It also provides a means of tracking the efficacy of recovery measures undertaken to improve survival and achieve recovery (Objective 3).

Through information synthesis and analysis, Objective 1 will improve adult-to-smolt survival by identifying watersheds exhibiting below average productivity and providing recommendations regarding remedial actions and information needs necessary to improve survival. Objective 2 will improve smolt-to-adult survival by identifying migration routes and other actions with the greatest potential to increase smolt-to-adult survival. This objective also monitors the efficacy of mainstem recovery actions. Objective 3 determines the success of measures to improve survival of chinook and steelhead by monitoring population status and trends through long-term databases (such as parr production, adult escapement, and others).

Section 8. Project description

a.   Technical and/or scientific background

Objective 1--The NMFS will make a decision in 1999 on how to ameliorate hydrosystem impacts to anadromous migrants (NMFS 1995). Although smolt-to-adult return rates are the factor most limiting recovery of Snake River basin anadromous populations, some watersheds have experienced significant habitat degradation (Platts et al. 1989). In order to maximize the benefit of the 1999 decision to Idaho's anadromous populations, it is prudent to ensure that spawning and rearing habitat in all major watersheds is of the best quality possible to speed recovery. There has been a significant increase in anadromous production monitoring during the 1990s primarily by IDFG and tribal entities in the Salmon and Clearwater River basins (Projects: 8909800, 8909801, 8909802, 8909803, 9005500, 8332300, 9064). During this same period, there has also been an increase in fish habitat-related surveys conducted by land management agencies. The fish production as well as habitat information is generally not readily accessible and has not been integrated. Under this objective fish production and habitat information will be synthesized on a watershed basis in FY 2000 as a first step toward increasing smolt production. This effort will produce a comprehensive report identifying the productivity of watersheds, potential limiting factors for chinook salmon and steelhead with recommendations for actions to improve survival. Population viability analysis for Salmon R. chinook populations will be a component of this report. Work on this objective began in 1999.

Objective 2-- Smolt-to-adult return rates decreased systematically as each of the lower Snake River dams and John Day dam became operational (Ebel 1977). Recovery actions to date have relied primarily on engineering solutions such as smolt transportation

and bypass systems to improve survival. Transportation was initiated due to transport:control ratios which the NMFS felt justified the program (Park 1985). The NMFS control group did not meet any scientific definition of a control group, however (Mundy et al. 1994; Ward et al. 1997). This project has pioneered the development of a model to estimate the smolt-to-adult survival of a true in-river migrant (control group) as well as survivals for other migration routes (e.g., transported groups by dam of collection, bypassed groups, and NMFS "control" group). Smolt-to-adult return rate estimates have important implications in determining hydrosystem based recovery measures as well as short-term management decisions to improve survival (e.g. whether or not to transport all steelhead from McNary dam in 1998). A manuscript regarding overall SAR for chinook salmon was submitted for peer-reviewed publication in 1998, and two manuscripts will be submitted in 1999 regarding survival by migration route and survival by date of transportation.

Objective 3 is composed of a number of tasks which monitor chinook and steelhead populations. The Snake River Salmon Recovery Plan (NMFS 1997) states that monitoring is an essential element of adaptive management and that scientists must have methods to count salmon in their natural environment. This objective provides many of the monitoring functions for spring and summer chinook salmon and steelhead in Idaho. Discussion follows on monitoring activities by major categories.

-- General parr monitoring has been ongoing since 1985 and is the most comprehensive database on salmon and steelhead in Idaho. The database has information on more than 154 streams in the Salmon, Clearwater and lower Snake River drainages contained in approximately 5,000 records. Percent carrying capacity and density estimates are determined for the following classes of juvenile salmon: wild and natural A-run and B-run steelhead and wild and natural spring and summer chinook salmon. These data have been used to estimate lifestage survival rates, index abundance, estimate replacement rates, and estimate rearing potential of different habitats. Regression of chinook density against escapement over Lower Granite dam yielded r2 values of 0.32 to 0.56 depending upon specific variables used (e.g. wild or natural chinook salmon). Regression of steelhead density against escapement over Lower Granite dam yielded r2 values of .05 to .63 depending upon specific variables used (e.g. run type or aggregate). Work began in 1999 to examine the number and location of index sites as a means of improving the correlation of all groups of chinook and steelhead with escapement over Lower Granite dam. Cramer and Neeley (1993) noted that the general parr monitoring information was an important index of abundance and recommended that the utility of this information could be improved by integrating general parr monitoring sites with escapement index areas. NMFS (1997) concurred that general parr monitoring information provided an alternative method of estimating whether delisting criteria for chinook salmon had been met. The need to implement an expansion of general parr monitoring sites in chinook and steelhead escapement index areas will be investigated in 1999. The general parr monitoring database also contains information on bull trout, westslope cutthroat, rainbow trout and other resident species.

-- Adult escapement. Monitoring adult chinook and steelhead escapement through redd counts is an accepted method of indexing population strength (Baker et al. 1996; English et al. 1992; Hill 1997). Some index areas in Idaho were established during the 1950s (Elms-Cockrum 1997). The NMFS (1997) identified delisting criteria based on a relative

replacement ratio and an estimate of the absolute number of fish escaped by metapopulation to achieve delisting. Currently, six of the 12 metapopulations identified by NMFS (1997) have few or no index sites. Additionally, metapopulation dynamics may not be represented by monitoring only a small number of streams (Rieman and McIntyre 1996). This project will establish baseline escapement data for all metapopulations so that the replacement ratio through time can be measured. Furthermore, there has been no work conducted to estimate total metapopulation escapement. Cramer and Neeley (1993) recommended a method to estimate total metapopulation escapement and other methods may also be appropriate (Skalski 1990). This is a new initiative with preliminary work undertaken in 1999.

-- Age structure of chinook salmon populations. Accurate age distribution information is important for spawner based recruit to parent ratios, estimates of brood year productivity, and as an indication of the amount of genetic exchange between brood years (Cramer and Neeley 1993). As salmon reach maturity, most scales are resorbed and total age cannot be estimated (Chilton and Bilton 1986). Due to the long migration of Snake River chinook this effect may be exacerbated (personal communications, Lisa Borgeson, ODFW aging lab and Shayne MacLellan, supervisor, fish aging lab, Fisheries and Oceans, Canada). Scales, ototliths, and fin rays have all been used to age chinook (Chilton and Bilton 1986) and other salmonids (Barber and McFarlane 1987; Hall 1991). Age validation is a critical step in achieving accurate age information (Beamish and McFarlane 1983). Scales from salmon carcasses have been collected for decades in Idaho, but verification was not necessarily conducted. This project will determine the most accurate method available to age Idaho's chinook salmon (scale, otolith, or fin ray). An archive of aging structures of known age chinook will be established for validation purposes from as many streams as possible. This method will be applied in the future and if possible, to past scale collections. This is a new initiative with work beginning in 1999.

-- Monitoring South Fork Clearwater River basin chinook salmon and steelhead production and productivity. Measurement of naturally produced juvenile chinook salmon and steelhead relative to adult escapement began in Crooked River in 1987 making it one of the longest datasets of its kind in Idaho. Lifestage survival rates such as egg-to-parr and parr-to-smolt, and stock:recruitment curves were produced (Kiefer and Lockhart 1994, 1997).   Additional intensive monitoring began in two other tributaries, Red River and American River, in 1992 as part of project 8909800.   This work is an important portion of the anadromous production and productivity monitoring occurring in Idaho. Weirs allow accurate counts of adult spawners (chinook and steelhead) and screw traps in conjunction with PIT tag detections allow estimation of smolt production.

b.   Rationale and significance to Regional Programs

This project improves adult-to-smolt (Objective 1) and smolt-to-adult (Objective 2) survivals by providing information on limiting factors and recommendations to improve survival.   This is accomplished by consolidating and analyzing data on an ecosystem basis and communicating the information to basin managers. This project also monitors the efficacy of recovery actions on a population basis and monitors population status (Objective 3). This is accomplished by collecting data, and managing and

analyzing long-term databases necessary to evaluate and track chinook salmon and steelhead population trends, status, and characteristics.

Objective 1 specifically relates to FWP measures 4.1a, 4.2a, and 7.1 which deal with t